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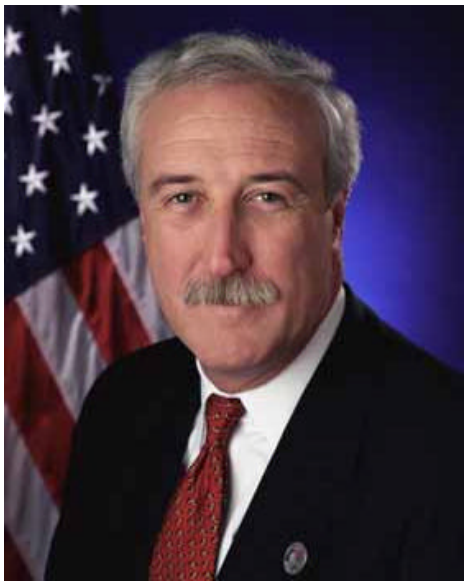


Hon. Sean O'Keefe, NASA Administrator

"This is NASA's vision for the future. Our mandate is:

- ***To improve the life here,***
- ***To extend life to there,***
- ***To find life beyond***

So, how do we get to that impressive picture of the future?
Part of the answer is by executing NASA's mission:

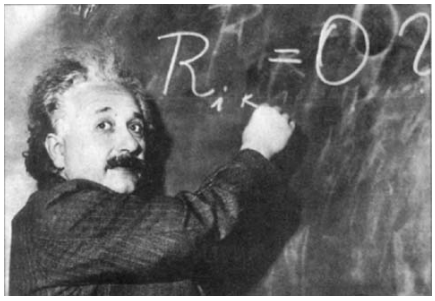
- ***To understand and protect our home planet***
- ***To explore the Universe and search for life***
- ***To inspire the next generation of explorers***

… as only NASA can."

(From the Address by the Honorable Sean O'Keefe, NASA Administrator, at the Maxwell School of Citizenship and Public Affairs, Syracuse University, New York, April 12, 2002)

"It is difficult to say what is impossible, for the dream of yesterday is the hope of today and the reality of tomorrow."

Robert H. Goddard
(1882-1945)



"Bear in mind that the wonderful things that you learn in your schools are the work of many generations. All this is put into your hands as your inheritance in order that you may receive it, honor it, add to it, and one day faithfully pass it on to your children.."

Albert Einstein
(1879 - 1955)

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Foreword

For more than four decades, NASA has been seen as the world's leading space organization. Its scientific discoveries and engineering accomplishments have marveled the young and the old, the experts and the amateurs, indeed the people of the world. We have been exploring the depths of the universe and also looked from space at our own home planet, monitoring its dynamic behavior, and helping protect and preserve it. Cutting edge technologies developed for space have been used for the betterment of human life here on earth. And in more recent years, NASA has taken upon itself the task of sharing the responsibility to educate the population and inspire new generations of scientists, engineers, and explorers.

NASA's past and present accomplishments have been made possible by the dedicated work of its employees and contractors, and the support of society. We assure that NASA's vision for the future will become a reality, by ensuring the availability of a workforce with superior professional, ethical, and leadership qualities. Indeed, education is currently one of our core mission elements.

The NASA Academy at the Goddard Space Flight Center has been an outstanding research and education program since its inception almost ten years ago. It represents the realization of the vision of Gerald A. Soffen, leading scientist, dedicated mentor, and beloved friend of many. Jerry knew that the future space enterprise leaders will emerge from the pool of bright and motivated students trained in colleges and universities throughout the country. He also knew that he was capable to extend these young enthusiasts a helping hand, by offering them an opportunity for fast-track introduction to, and familiarization with the NASA agency. So, he created an Academy, the "NASA Academy at the Goddard Space Flight Center". Organized as an intensive, resident, ten-week summer program, it combines laboratory research work, group projects, lectures, meetings with experts and administrators, visits to NASA Centers and space-related industries, technical writing, and public presentations in poster sessions and scientific symposia.

After the Goddard Academy model, other NASA Centers have hosted Academy programs, having graduated so far 364 students with various science and engineering profiles. Many of the "older" Academy alumni are now occupying leadership positions within the NASA Agency and its supporting industries.

I have been impressed by the quality and character of Academy participants since my introduction to the program by my friend, Jerry Soffen, many years ago. I am honored to have had an opportunity to be a part of the evolution of the Academy program in recent years. I am dedicated to continuing Jerry's legacy.

A.V. Diaz
Director
NASA Goddard Space Flight Center
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Introduction

For a decade, the NASA Academy has paired excellent students with scientists and engineers from Goddard Space Flight Center to work on fascinating, relevant research projects. For ten weeks during each summer, a group of carefully selected students forms a team and explores in some detail how NASA operates, with research, many lectures, visits to NASA related sites, and meetings with leaders at various levels in various places.

The goal of the program is not to have people who have “been to the Academy" but people who are in the space program. The alumni from the academies at the selected NASA centers are the reason for those academies.

The leading edge of the Academy alumni, those from the first few Academies, consists of people now about 30 years old. Many have finished their graduate education, often by participating in other NASA programs such as the Graduate Student Researchers Program and the National Academy of Sciences post-doctoral fellowship program. Several are now NASA employees, some of whom have won Director's Discretionary Fund awards themselves and became mentors to later Academy students.

Since I have just arrived recently at Goddard, the 2003 Academy is my first. I am looking forward to it eagerly. I hope you are as well.

Vigdor L. Teplitz

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Physics of the Universe (POTU)

by

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POTU is the interagency response to initiatives recommended by the National Academy of Sciences. These initiatives, at the border between physics and astronomy, address 11 major science questions. POTU includes a $5B NASA program, “Beyond Einstein,” with 5 space shots in which Goddard has the lead and for which technology development was included in the NASA part of the President's 2004 budget proposal. Beyond Einstein includes two "Great Observatories" - CON-X (X-rays from black holes) and LISA (gravitational waves, joint with the European Space Agency (ESA)) - and three lower cost probes - CMBPOL (polarization of the cosmic microwave background), dark energy probe, and an x-ray black hole census probe. Major contributing DOE and NSF parts of POTU will also be discussed.

The Two Relativities

by

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This lecture is an introduction to both the special and general theories of relativity at the upper division undergraduate level. The presentation is intended to give the background information needed to understand the standard relativistic models of the universe. The relationships between space and time, and matter and energy, are explored. While there is some mathematics, the emphasis is on the fundamental ideas of spacetime, and gravitation as the curvature of spacetime.

Relativistic Cosmology

by

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Current models of the universe are based on the fact that at the largest scales it is homogeneous and isotropic, and that the further away a galaxy is from our own, the more its spectrum is redshifted. This spectral displacement is interpreted as indicating motion away from us, so the universe is assumed to be exploding. The overall structure of the universe is determined by gravitation, which itself is the curvature of spacetime caused by matter and energy. Even a flat universe requires curvature to explain its structure. This lecture is at the upper division undergraduate level with some mathematics.

The Wilkinson Microwave Anisotropy Probe (WMAP)

by

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Diffuse Background Radiation

by

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Diffuse background radiation, at all wavelengths of the electromagnetic spectrum, conveys unique information about the universe, from the echo of the big bang to information on the composition of the intergalactic medium. My talk will focus on discussion of the detailed spectrum of the diffuse background, as shown in the figure. The circled numbers in the figure refer to published references concerning the background radiation in various wavelength (or energy) regimes; the references themselves appear below.

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Gravitational Waves and the LISA Mission

by

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Gravitational waves are ripples in the fabric of spacetime that travel at the speed of light. Einstein's Theory of General Relativity predicts that gravitational waves will be produced when massive objects such as black holes interact. The LISA mission is designed to detect these waves using laser interferometry in space, opening a new observational window on the universe.

Preliminary Results from the Mars Odyssey Gamma-Ray Spectrometer

by

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The Gamma Ray Spectrometer (GRS), part of the scientific payload onboard the Mars Odyssey spacecraft, is a significant component of NASA's Mars Surveyor Program. This is an ongoing initiative to explore Mars with orbiters, landers, and rovers. The GRS is a suite of three instruments designed to analyze the chemical composition of the Martian surface and to detect water at shallow subsurface depths. The GRS addresses the fundamental objectives of the Mars Surveyor Program; namely, to understand the Martian environment and its history, to determine whether this environment supported life (or supports it still), and to assess the resources available on the planet. Preliminary results from the first year of operation in Mars orbit will be presented.

Asteroids and Meteorites

by

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Asteroids, once thought of by astronomers as "vermin of the skies", are now known to contain important clues concerning the origin and history of our solar system. Some asteroids are thought to be virtually unchanged in composition since the formation of the solar system.

Meteorites, stones that fell from the sky, were once dismissed as folk tales or terrestrial rocks struck by lightning. Now our knowledge of the origins of the solar system is, to a large extent, based on the study of meteorites. Our knowledge concerning the age of the solar system is based on the age of the oldest meteorites.

One of the goals of the recent Near Earth Asteroid Rendezvous (NEAR) mission was to establish a connection between this one asteroid as the parent body of a known meteorite type. The results from this mission will be discussed.

Magnetic Exploration of the Solar System

by

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Since the early 1960's planetary exploration spacecraft like Pioneer, Mariner, Voyager, Mars Global Surveyor, Giotto, Lunar Prospector and others, have carried aboard instruments to measure magnetic fields. What is the purpose of these measurements? We know that Earth has a magnetic field and that compasses generally "point North" - but how is this field generated? What does a magnetic field tell us about a planet? Could the presence of magnetic field be significant for the existence of life? We will explore these and other fascinating questions and the knowledge obtained from planetary exploration spacecraft during this lecture.

Volcanoes and Gullies: Recent Developments in Mars Exploration

by

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The exploration of Mars has had a twenty year hiatus between the Viking missions of the 1970's, and the more recent Pathfinder, Mars Global Surveyor, and Mars Orbiter Missions. The last three missions have totally changed our understanding of Mars in many ways. We have revised our views from a cold, geologically inactive, fairly dry current Mars into a planet with probable geologically recent volcanism, surface water flow, dynamic ice caps, and clear remnants of a substantial magnetic field from a prior geologic era. We will explore the scientific results and ramifications from these missions, and look ahead to the dual Mars Exploration Rover launches this May and June.

Exploring Space, Exploring Earth: The Impact of Space Research on Geology and Geophysics

by

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The second major discovery from space flight was the shape of the solid earth, which Vanguard 1 tracking showed to be very slightly "pear-shaped" as it was termed in newspaper headlines the world over. Being lucky enough to be the first geologist hired by NASA in 1959, I have had a ring-side seat at exploration of the earth from space, and exploration of the Moon and planets. In this talk I will summarize discoveries in space geodesy, terrestrial magnetism, remote sensing, tectonics, and impact cratering. Finally, I will summarize my own theory for the tectonic evolution of the Earth, derived from earth-oriented studies and comparative planetology. I propose that terrestrial tectonics for the last 2 billion years had been fundamentally controlled by the existence of life on Earth. This theory was put forth in my book, whose title is the title of this abstract.

Iturralde Crater Expedition (ICE 2002)

by

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During a recon of the edge of the southernmost extent of the Amazon rainforest (in 1985) using Landsat imagery, a circular feature about 8 kilometers in diameter was discovered in northern Bolivia. No geological explanation for the feature was forthcoming and therefore it must be a meteorite impact crater? But this must be verified. In September 2002 a diverse array of collaborators including the indigenous Araona, the Red Devil Task Force (with their helicopters) the US embassy in Bolivia, NASA headquarters, Museo Noell Kempff set the stage for the NASA science team, the trail cutters, biologists, educators and high school students from Bolivia to land inside the Iturralde structure and proceed to find the "smoking gun". We did not find it but we are more convinced that the structure is a crater, the youngest large crater on Earth into a soft target-the thick sediment cover. We never found a rock. Soil sampling, magnetometer traverses, and biological surveys that were conducted all demonstrate anomalies when inside and outside the crater are contrasted.

Advanced imagery- Shuttle Radar Topography Mission (SRTM), IKONOS, EO-1 additionally argue for topographic and vegetative contrasts. IPFB -The Bolivian oil consortium has proprietary magnetometer, gravity, and seismic evidence that was unavailable to us before the expedition. We viewed some of the information which overlays or is close enough to the 8 kilometer diameter feature to be instructive and this will allow us to make a strong case for solicitation of funding that will allow us to return and drill for the verification-for the finding of the "smoking gun".

I will try to give you a sense of the true jungle adventure that we experienced during the month of September as we (all airborne on 9/11) moved in smaller and smaller planes to the jump-off point (Puerto Araona- the indigenous village) and then into the "crater".

Dual Technology Programs in the Development of Unattended and Remote Technologies

by

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Unattended and remote detection systems find application in such diverse applications as space exploration, telemedicine, teleforensics and applications to operations in homeland security and nuclear non-proliferation programs. With the decrease in funding for research in the various government agencies involved in the development these technologies, it has become important that dual technology programs be undertaken so that progress can be made in the development of such unattended and remote systems. These developments can then find application in a myriad of fields. An example of such a program is the NASA/NIJ program in teleforensics. The National Institute of Justice (NIJ) and the National Aeronautics and Space Administration's (NASA) Goddard Space Flight Center (GSFC) have teamed up to explore the use of NASA developed technologies to help criminal justice agencies and professionals solve crimes. The objective of the program is to produce instruments and communication networks that have application within both NASA's space program and NIJ programs with state and local forensic laboratories. A discussion of the results already achieved in the non-destructive analysis of forensic evidence at crime scenes and the application of the systems developed for Mars Rover missions will be discussed.

Geoscience Laser Altimeter System (GLAS) for the ICESat Mission

by

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A summary of spaceborne laser altimeters designed and built at GSFC will be discussed leading up to the most recently launched instrument GLAS, the sole instrument of the Ice, Cloud and land Elevation Satellite (ICESat). Present status and performance of the GLAS instrument will be presented.

Distributed Space Systems (DSS) Technology

by

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Distributed Space Systems (DSS) Technology allows NASA to exploit new vantage points, develop new sensing strategies and implement system-wide techniques which promote agility, adaptability, evolvability, scalability, and affordability through exploitation of multiple space platforms. This talk will present and end-to-end picture of DSS from a mission, technology, and systems engineering perspective, with a strong focus on precision formation flying spacecraft. Based on the collective inputs of a DSS tiger team which was formed from elements across Goddard's engineering centers and science directorates, the multidisciplinary area will be defined, emphasizing near-term, mid-term, and future mission concepts. Some highlights will be made on engineering challenges and science and data processing challenges (e.g., for multi-sensor fusion from sensor web elements). Additionally, some key DSS technology development activities will be highlighted along with the formation flying testbed (FFTB) which is used for integrated system-level analysis for the engineering element of formation flying missions. A systems engineering requirements allocation process will be laid out for an example proposed future mission.

GSFC Chief Engineer's Office: Ensuring Mission Success

by

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"Advisors to Center Management" will address the role of the Chief Engineer's Office in providing advice to the Management of Goddard Space Flight Center on programmatic, engineering, science, and technology issues, problems, and resolutions. This section will also discuss the role of the Chief Engineer's Office in ensuring technical excellence across the Center.

"Reviews" will discuss the role of the Chief Engineer's Office in chairing and participating in the many technical reviews required in the NASA Developmental and Testing Life cycle of program and projects.

"Troubleshooting" will describe the role the Chief Engineer's Office plays in identifying and resolving technical problems at GSFC. It will describe the "special assignments" where the Chief Engineer is called upon to resolve difficult engineering problems before a mission can launch.

"Standards" will describe the many activities in which the Chief Engineer's Office engages to ensure standards are developed, published, and disseminated for both GSFC and the entire Agency.

"Publications" will describe the role the Chief Engineer's Office plays in reviewing all engineering publications before they are released to be presented at seminars or conferences or to be published in technical journals and other publications.

"Knowledge Management" will discuss the role the Chief Engineer's Office plays in capturing knowledge and allowing it to be easily accessed by Center Personnel. This includes developing databases and interfaces, collecting and reviewing "Lessons Learned," and capturing the knowledge of experienced retirees and departing employees in critical skill areas before they leave the Center.

"Minicourses" offer a unique way to capture knowledge and to educate young engineers in a very informal environment. They also provide an excellent way for specialized engineers to learn about other engineering disciplines and for systems engineers to acquire multi-disciplinary expertise. Their use in ensuring technical excellence will be described here.

"Pre-Monthly Status Reviews" and "Monthly Status Reviews" offer the Chief Engineer's Office an excellent opportunity to keep its finger on the pulse of Projects' technical and programmatic progress. The Chief Engineer's Office's role in these regular meetings and reviews will be described.
"Recruiting" will discuss the participation of the Chief Engineer's Office in ensuring that top technical talent is hired and workplace diversity goals are met.

Finally, the "Technology Interfaces" presentation will describe the role of the Chief Engineer's Office in identifying appropriate technology solutions from advanced technologies under development for application on current and planned NASA projects. It will describe the relationship between the Chief Engineer and the Chief Technologist. It will describe the role of the Chief Engineer in ensuring technical excellence in meeting goals on technology validation missions like the New Millenium Program.

Nanotechnology, a Vast Field for the Creative Mind

by

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Nanotechnology is a new and exciting field that comprises many disciplines and will be always in need of creative and diverse minds. It should be kept in mind by the new generation of scientists and engineers as an exciting and fulfilling area of study. I will address the future implications and my vision for Nanotechnology for GSFC and NASA. I will talk about nanotechnology in general and specifically about carbon nanotubes. Carbon Nanotubes are these amazing molecules that provide nanotechnology with a powerful tool for new discoveries.

Architecture Key Points for the Design of NASA's Orbital Space Plane

by

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As part of its revised Integrated Space Transportation Plan, NASA has designated that an Orbital Space Plane (OSP) be developed to service crew rescue and transportation needs to and from the International Space Station. Key elements of the OSP include a specific completion schedule, small vehicle crew size, limited technology development, and an open trade space as to the exact nature of the vehicle(s) that will be used to satisfy NASA's top-level requirements. The Advanced Programs Group (APG) at Orbital Sciences Corp. (no relation to the OSP namesake) has won a contract to conduct systems studies and to develop systems requirements for the OSP. As part of the APG team, several former NASA Academy students and staff are participating in this effort. This talk will focus on the team effort required to develop the OSP concept and each individual's contribution to the project as a whole.

NASA's Education Programs

by

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"Ad Astra !"
A Compelling Space and Astronomy Quiz

by

Dr. Hugh Hill, Assistant Professor, International Space University, Strasbourg, France
http://www.isunet.edu/faculty/hugh_hill.htm

hosted by

Dr. Steven B. Kraemer, Associate Professor., Institute for Astrophysics and Computational Sciences, Catholic University of America, and
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This thrilling ~90-minute quiz will test your comprehension of topics terrestrial and extraterrestrial. Steve is the only member of the American Astronomical Society to get a mention in Christiane Bird's "Guide to Live Jazz and Blues in the U.S".

You will be a member of one of three NASA Academy "Teams", with 4/5 participants per team. You should choose a name for your team with a suitably astronomical theme e.g. "Halley's Comets". The Quizmaster, Professor Kraemer, will bombard you with ten rounds of questions (200-300 questions in total). In terms of scoring, the correct answer will be awarded two points unless otherwise stated by the Quizmaster. If a Team doesn't know the answer, or the answer is incorrect, the question is passed to the next Team (in a clockwise direction), who may earn two points. If this team too cannot answer the question, it then goes to the final Team.

The (ten) rounds will be composed as follows:

- 4 x International General Knowledge
- 3 x Astronomy
- 3 x Space Fact and Fiction

The "International General Knowledge" questions will be on history and geography and will have more than their fair share of questions on general science, technology and engineering. The "Astronomy" section will include: classical astronomy, astrophysics and planetary science, but will not assume a specialist knowledge of these topics. The "Space Fact and Fiction" section will include spaceflight, space missions, space literature, space-related movies and related topics. Novel aspects of the quiz will include a special section entitled "Who am I ?", where Teams will have to guess the identity of famous personalities from the fields of Space and Astronomy.

Education … as only NASA Can

by

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Legal Aspects of Controlled and Uncontrolled Satellite Re-Entry

by

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Mr. Schuman will discuss, with slides, legal issues arising from the recent planned re-entry of the Compton Gamma Ray Observatory Spacecraft, managed by the Goddard Space Flight Center, as well as those associated with the Space Shuttle Columbia accident -- including technical issues affecting re-entry, international treaty obligations, processing claims for personal injury and property damage, requests under the Freedom of Information Act, and activities of the Columbia Accident Investigation Board. Time permitting, he will also discuss general legal work of Goddard's Office of Chief Counsel, such as Government contracts, ethics, and real property issues.

The International Space University (ISU)

by

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Peggy Finarelli and her colleagues from the International Space University (ISU) will talk about ISU and its programs, a two-month Summer Session Program and a one-year Master of Space Studies program.

ISU offers its students a unique graduate-level educational experience in both its Summer and Masters programs. These programs are interdisciplinary, covering all aspects of space programs and enterprises -- space science, space engineering, systems engineering, space policy and law, business and management, and space and society. By providing international graduate students and young space professionals both an intensive interdisciplinary curriculum and also the opportunity to solve complex problems together in an intercultural environment, ISU is preparing the future leaders of the emerging global space community... an ideal next step for NASA Academy alumni.

Since its founding in 1988, ISU has graduated more than 1800 students from 84 countries. Together with hundreds of ISU faculty and lecturers from around the world, these alumni comprise an extremely effective network that actively facilitates individual career growth, professional activities and international space cooperation.

Scholarship support is available at the International Space University specifically for NASA Academy Alumni. ISU will provide the equivalent of two full scholarships (potentially in the form of partial scholarships depending upon need and demand) -- one for ISU's 2004 Summer Session Program, which will be held in Adelaide, Australia; the other, for next year's Master of Space Studies program, which will also be conducted at ISU's Central Campus in Strasbourg, France, September 2004-July 2005.

The LunarSat Project

by

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http://www.lunarsat.de

LunarSat is a proposal for a 120 kg micro-satellite to investigate the Moon, in particular its South Pole's suitability for the first permanent human outpost in connection with ESA's Aurora initiative. The spacecraft will research the morphology and mineralogy of the Moon's surface, determine the physical properties of the Lunar exosphere and magnetosphere and, most important, will look for sub-surface water deposits. The orbiter will provide the best high-resolution mapping data of the South Pole ever acquired. The mission has an unusually strong focus on outreach and education and is primarily being designed by young professionals and students across Europe. It shall involve more than 50000 young people, primarily in ESA member states, but we are very much open to collaborations with e.g. young professionals in other countries.

Leadership in Crisis

by

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Leadership is a Choice!

by

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At Cindy Zook Associates we are passionate about producing real results that make a difference in the world. With nearly twenty years experience in organization and management development, we have facilitated strategic planning, organizational transformations, team development, leadership development, and program planning in numerous public and private organizations.

We believe that leadership is a choice. Therefore, our work in developing leaders is not about improving public speaking skills or sharpening presentation styles. Rather, leadership development is about helping individuals to make powerful, difficult, and sometimes, costly choices to *lead*. We work with individuals to develop their capacity to make effective leadership choices in three key dimensions:

- **Alignment:** We work with leaders to clarify what they stand for in the world and figure out the source of their passion and energy. We work with them to connect their values, passion and energy to the mission of their organization. Finally, we help them envision a future they want to create in their organization and communicate that vision in a way that compels others to follow.
- **Results:** We work with leaders to help them identify results that are observable, measurable, and valuable to the organization; results that connect to values, mission and vision; results that challenge the status quo.
- **Action:** We help clients identify the steps that will achieve their desired results, specify who their key partners will be, and plan how they will hold themselves accountable for implementing their strategy.

Members of the NASA Academy will be invited to participate in an interactive dialogue to explore their own leadership journeys. We will challenge participants to consider three important questions:

- **What are the values that guide you?** (What is non-negotiable for you? What do you stand for in the world?)
- **What is your commitment to a mission?** (How do your values align with the work you want to do? What excites you about the work you want to do?)
- **What is the vivid picture of the future you want to create?** (What is your vision? What does success look like?)

Leadership

by

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